a second lens group, arranged in an optical path between said first lens group and an image of said pattern, having a negative refractive power;

a third lens group, arranged in an optical path between said second lens group and said image, having a positive refractive power;

a fourth lens group, arranged in an optical path between said third lens group and said image, having a negative refractive power and a first aspherical surface;

a fifth lens group, arranged in an optical path between said fourth lens group and said image, having a positive refractive power and an aperture stop;

wherein in said projection optical system, paraxial rays travelling parallel to the optical axis imagewise toward objectwise intersect the optical axis at a location Q between said fourth lens group and said fifth lens group;

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at least one of said fourth and fifth lens groups includes a second aspherical surface arranged between said first aspherical surface and said aperture stop;

said fifth lens group includes a third aspherical surface arranged imagewise of said aperture stop; and

wherein the following condition is satisfied:

$$0.01 < d_Q / \{L \times (1 - NA)\} < 0.4$$

wherein the image and the pattern are separated by a distance L, said location Q and said aperture stop are separated by a distance d_Q, and NA is an imagewise numerical aperture of the projection optical system.--

--40. A device manufacturing method comprising the steps of:

coating a photosensitive material onto a substrate;

projecting onto said substrate an image of a pattern of a reticle through a projection optical system;

developing said photosensitive material on said substrate, thereby forming a photoresist pattern;

wherein said projection optical system comprises along an optical axis:

a first lens group having a positive power;

a second lens group, arranged in an optical path between said first lens group and an image of said pattern, having a negative refractive power;

a third lens group, arranged in an optical path between said second lens group and said image, having a positive refractive power;

a fourth lens group, arranged in an optical path between said third lens group and said image, having a negative refractive power and a first aspherical surface;

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a fifth lens group, arranged in an optical path between said fourth lens group and said image, having a positive refractive power and an aperture stop;

wherein in said projection optical system, paraxial rays travelling parallel to the optical axis imagewise toward objectwise intersect the optical axis at a location Q between said fourth lens group and said fifth lens group;

at least one of said fourth and fifth lens groups includes a second aspherical surface arranged between said first aspherical surface and said aperture stop;

said fifth lens group includes a third aspherical surface arranged imagewise of said aperture stop; and

wherein the following condition is satisfied:

$$0.01 < d_Q / \{L \times (1 - NA)\} < 0.4$$

wherein the image and the pattern are separated by a distance L, said location Q and said aperture stop are separated by a distance d_Q, and NA is an imagewise numerical aperture of the projection optical system.--

--41. A method according to claim 40, further comprising the step, after said developing step, of forming a pattern in said substrate based on said photoresist pattern.--

--42. A projection optical system capable of forming an image of an object, comprising along an optical axis:

a first lens group having a positive power;

a second lens group, arranged in an optical path between said first lens group and an image of a pattern of said object, having a negative refractive power;

a third lens group, arranged in an optical path between said second lens group and said image, having a positive refractive power;

a fourth lens group, arranged in an optical path between said third lens group and said image, having a negative refractive power and a first aspherical surface;

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a fifth lens group, arranged in an optical path between said fourth lens group and said image, having a positive refractive power and an aperture stop;

wherein in said projection optical system, paraxial rays travelling parallel to the optical axis imagewise toward objectwise intersect the optical axis at a location Q between said fourth lens group and said fifth lens group;

at least one of said fourth and fifth lens groups includes a second aspherical surface arranged between said first aspherical surface and said aperture stop;

said fifth lens group includes a third aspherical surface arranged imagewise of said aperture stop;

said first aspherical surface is concave and includes refractive power at a paraxial region and refractive power at a periphery, wherein said refractive power at said periphery is weaker than said refractive power at said paraxial region;

said second aspherical surface includes refractive power at a paraxial region, and refractive power at a periphery, wherein said refractive power at said periphery is more negative than said refractive power at said paraxial region;

said third aspherical surface includes refractive power at a paraxial region, and refractive power at a periphery, wherein said refractive power at said periphery is more negative than said refractive power at said paraxial region; and

wherein the following condition is satisfied:

$$0.01 < d_Q / \{L \times (1 - NA)\} < 0.4$$

wherein the image and the pattern are separated by a distance L, said location Q and said aperture stop are separated by a distance d_Q, and NA is an imagewise numerical aperture of the projection optical system.--

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--43. A scanning projection exposure apparatus for projecting an image of a pattern on a reticle onto a photosensitive workpiece, comprising:

a first stage that is movable along a scanning direction and supports said reticle at a first surface;

an illuminating optical system adjacent said first stage arranged so as to illuminate the reticle with light;

a second stage that is movable along at least a scanning direction, for supporting the photosensitive workpiece at a second surface;

a projection optical system, arranged in an optical path between said first surface and said second surface, having a plurality of lenses and an aperture stop;

wherein positions and shapes of said plurality of lenses and a position of said aperture stop are determined such that said light from said reticle is capable of being guided to an exposure field on said workpiece with a maximum numerical aperture of at least 0.8;

wherein said exposure region has a first dimension perpendicular to said scanning direction, and a second dimension along said scanning direction; and

wherein said first dimension is at least 15mm.--

--44. A scanning projection exposure apparatus according to claim 43, wherein said exposure field has a slit shape, with said first dimension of said slit shape being at least 25mm.--

--45. A scanning projection exposure apparatus according to claim 43, wherein said plurality of lenses in the projection optical system include an aspherical lens surface.--

--46. A scanning projection exposure apparatus according to claim 45, wherein said exposure field has a slit shape, with said first dimension of said slit shape being at least 25mm.--

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--47. A scanning projection exposure apparatus according to claim 45, wherein said plurality of lenses in the projection optical system include at least three aspherical surfaces.--

--48. A scanning projection exposure apparatus according to claim 43, wherein the number of lenses objectwise of said aperture stop is at least six, and the number of lenses imagewise of said aperture stop is at least four.--

--49. A scanning projection exposure apparatus according to claim 48, wherein said plurality of lenses in the projection optical system include an aspherical lens surface.--

--50. A scanning projection exposure apparatus according to claim 43, wherein said aperture stop has a variable size.--

--51. A scanning projection exposure apparatus according to claim 50, wherein the number of lenses objectwise of said aperture stop is at least six, and the number of lenses imagewise of said aperture stop is at least four.--

--52. A scanning projection exposure apparatus according to claim 51, wherein said plurality of lenses in the projection optical system include an aspherical lens surface.--

--53. A method of patterning a photosensitive workpiece with a pattern present on a reticle, the method comprising the steps of:

illuminating said reticle with light from said illuminating optical system of said apparatus according to claim 43;

projecting light from said reticle with said projection optical system of said apparatus according to claim 43; and

exposing said photosensitive workpiece over said exposure field.--

--54. A projection optical system capable of forming a reduced image of an object onto an exposure field, comprising:

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a plurality of lenses arranged along an optical axis of the projection optical system;

an aperture stop arranged among said plurality of lenses;

wherein said plurality of lenses are arranged and formed so as to perform an imagewise maximum numerical aperture of at least 0.8 through the exposure field.--

--55. A projection optical system according to claim 54, wherein said plurality of lenses includes an aspherical lens surface.--

--56. A projection optical system according to claim 55, wherein said exposure field has a dimension of at least 25mm.--

--57. A projection optical system according to claim 55, wherein said plurality of lenses include a first positive group of lenses, a second positive group of lenses, and a negative group of lenses arranged between said first group of lenses and said second group of lenses.--

--58. A projection optical system according to claim 57, wherein said first positive group of lenses includes a negative lens, and said second positive group of lenses includes a negative lens.--

--59. A projection optical system according to claim 57, wherein said aperture stop is arranged in said second group of lenses.--

--60. A projection optical system according to claim 57, wherein said plurality of lenses further includes an additional negative group of lenses arranged between said first group of lenses and said second group of lenses, and a third positive group of lenses is arranged between said negative group of lenses and said another negative group of lenses.--

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--61. A projection optical system according to claim 55, wherein the number of lenses objectwise of said aperture stop is at least six, and the number of lenses imagewise of said aperture stop is at least four.--

--62. A projection optical system according to claim 54, wherein said plurality of lenses includes at least three aspherical lens surfaces.--

--63. A projection optical system according to claim 54, wherein said plurality of lenses including an aspherical lens surface with refractive power at a paraxial region and refractive power at a periphery, and wherein said refractive power at said periphery is weaker than said refractive power at said paraxial region.--

--64. A projection optical system according to claim 55, wherein said plurality of lenses further includes an another aspherical lens surface with refractive power at a paraxial region and refractive power at a periphery, and wherein said refractive power at said periphery is stronger than said refractive power at said paraxial region.--

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--65. A projection optical system according to claim 54, wherein said plurality of lenses includes an aspherical lens surface with refractive power at a paraxial region and

refractive power at a periphery, and wherein said refractive power at said periphery is stronger than said refractive power at said paraxial region.--

--66. A projection optical system according to claim 54, wherein said aspherical lens surface has a refractive power at a paraxial region and a refractive power at a periphery, and wherein said refractive power at said periphery returns in the direction of said refractive power in said paraxial region.--

--67. A projection optical system capable of forming an image of an object on a first surface onto a second surface, comprising:

a first lens group, arranged in an optical path between said first surface and said second surface, having a negative refractive power and a negative lens;

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a second lens group, arranged in an optical path between said first lens group and said second surface, having a positive refractive power and a positive lens;

a third lens group, arranged in an optical path between said second lens group and said second surface, having a negative refractive power and a negative lens;

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a fourth lens group, arranged in an optical path between said third lens group and said second surface, having a positive refractive power and a positive lens; and

an imagewise maximum numerical aperture of at least 0.8.--

--68. A projection optical system according to claim 67, wherein said projection optical system comprises a plurality of lenses including an aspherical surface.--

--69. A projection optical system according to claim 68, wherein said aspherical lens surface has a refractive power at a paraxial region and a refractive power at a periphery, and wherein said refractive power at said periphery is weaker than said refractive power at said paraxial region.--

--70. A projection optical system according to claim 69, wherein said aspherical lens surface has a refractive power at a paraxial region and a refractive power at a periphery, and wherein said refractive power at said periphery is stronger than said refractive power at said paraxial region.--

--71. A projection optical system according to claim 68, wherein said aspherical lens surface has a refractive power at a paraxial region and a refractive power at a periphery, and wherein said refractive power at said periphery is stronger than said refractive power at said paraxial region.--

--72. A projection optical system according to claim 68, wherein said aspherical lens surface has a refractive power at a paraxial region and a refractive power at a periphery, and wherein said refractive power at said periphery returns in the direction of said refractive power in said paraxial region.--

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--73. A projection optical system according to claim 67, wherein the first lens group has a plurality of negative lenses.--

--74. A projection optical system according to claim 67, wherein the second lens group has a plurality of positive lenses.--

--75. A projection optical system according to claim 67, wherein the third lens group has a plurality of negative lenses.--

--76. A projection optical system according to claim 67, wherein the fourth lens group has a plurality of positive lenses.--

--77. A projection optical system according to claim 76, wherein said fourth lens group has a negative lens.--

--78. A projection optical system according to claim 67, further comprising a fifth lens group, arranged in an optical path between said first surface and said first lens group, having a positive refractive power.--

--79. A projection optical system according to claim 67, further comprising an aperture stop arranged in an optical path between said third lens group and said second surface.--

--80. A projection optical system capable of forming an image of an object on a first surface onto a second surface, comprising:

a first lens group, arranged in an optical path between said first surface and said second surface, having a positive refractive power and a positive lens;

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a second lens group, arranged in an optical path between said first lens group and said second surface, having a negative refractive power and a negative lens;

a third lens group, arranged in an optical path between said second lens group and said second surface, having a positive refractive power and a positive lens; and

an imagewise maximum numerical aperture of at least 0.8.--

--81. A projection optical system according to claim 80, further comprising a fourth lens group, arranged in an optical path between said first lens group and said second lens group, having a positive refractive power and a positive lens.--

--82. A projection optical system according to claim 81, further comprising a fifth lens group, arranged in an optical path between said first lens group and said fourth lens group, having a negative refractive power and a negative lens.--

--83. A projection optical system according to claim 80, wherein said first lens group has a negative lens.--

--84. A projection optical system according to claim 83, wherein said negative lens in said first lens group is arranged most objectwise.--

--85. A projection optical system according to claim 80, wherein the second lens group has a plurality of negative lenses.--

--86. A projection optical system according to claim 80, wherein said third lens group has a negative lens.--

--87. A projection optical system according to claim 80, wherein said projection optical system comprises a plurality of lenses including an aspherical surface.--

--88. A projection optical system according to claim 87, wherein at least one of said aspherical lens surfaces has a refractive power at a paraxial region and a refractive power at a periphery, and wherein said refractive power at said periphery is weaker than said refractive power at said paraxial region.--

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--89. A projection optical system according to claim 88, wherein a different one of said aspherical lens surfaces has a refractive power at a paraxial region and a refractive power at a periphery, and wherein said refractive power at said periphery is stronger than said refractive power at said paraxial region.--

--90. A projection optical system according to claim 87, wherein said aspherical lens surface has a refractive power at a paraxial region and a refractive power at a periphery, and wherein said refractive power at said periphery is stronger than said refractive power at said paraxial region.--

--91. A projection optical system according to claim 87, wherein said aspherical lens surface has a refractive power at a paraxial region and a refractive power at a periphery, and wherein said refractive power at said periphery returns in the direction of said refractive power in said paraxial region.--

--92. A projection optical system according to claim 80, further comprising an aperture stop arranged in an optical path between said second lens group and said second surface.--

--93. A projection optical system capable of forming an image of an object on a first surface onto a second surface, comprising:

a plurality of lenses;

an aperture stop; and

at least three aspherical surfaces arranged in an optical path between said first surface and said aperture stop;

wherein said plurality of lenses and said at least three aspherical surfaces guide a light flux from said first surface toward said second surface, and wherein said light flux has a maximum imagewise numerical aperture of at least 0.8.--

--94. A scanning projection exposure apparatus for projecting an image of a pattern on a reticle onto a photosensitive workpiece, comprising:

a first stage that is movable along a scanning direction and supports said reticle at a first surface;

an illuminating optical system adjacent said first stage and arranged so as to illuminate the reticle with light;

a second stage that is movable along at least said scanning direction, for supporting the photosensitive workpiece at a second surface; and

a projection optical system according to claim 67 arranged in an optical path between said first surface and said second surface.--

--95. A scanning projection exposure apparatus for projecting an image of a pattern on a reticle onto a photosensitive workpiece, comprising:

a first stage that is movable along a scanning direction and supports said reticle at a first surface;

an illuminating optical system adjacent said first stage and arranged so as to illuminate the reticle with light;

a second stage that is movable along at least said scanning direction, for supporting the photosensitive workpiece at a second surface; and

a projection optical system according to claim 80 arranged in an optical path between said first surface and said second surface.--

--96. A scanning projection exposure apparatus for projecting an image of a pattern on a reticle onto a photosensitive workpiece, comprising:

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a first stage that is movable along a scanning direction and supports said reticle at a first surface;

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an illuminating optical system adjacent said first stage and arranged so as to illuminate the reticle with light;

a second stage that is movable along at least said scanning direction, for supporting the photosensitive workpiece at a second surface; and

a projection optical system according to claim 93 arranged in an optical path between said first surface and said second surface.--

--97. A method of patterning a photosensitive workpiece with a pattern present on a reticle, the method comprising the steps of:

illuminating said reticle;

projecting light from said reticle with a projection optical system according to claim 67; and

exposing said photosensitive workpiece over an exposure field.--

--98. A method of patterning a photosensitive workpiece with a pattern present on a reticle, the method comprising the steps of:

illuminating said reticle;

projecting light from said reticle with a projection optical system according to claim 80; and

exposing said photosensitive workpiece over an exposure field.--

--99. A method of patterning a photosensitive workpiece with a pattern present on a reticle, the method comprising the steps of:

illuminating said reticle;

projecting light from said reticle with a projection optical system according to claim 93; and

exposing said photosensitive workpiece over an exposure field.--

--100. A scanning projection exposure apparatus for projecting an image of a pattern on a reticle onto a photosensitive workpiece, comprising:

a first stage that is movable along a scanning direction and supports said reticle at a first surface;

an illuminating optical system adjacent said first stage and arranged so as to illuminate the reticle with light;

a second stage that is movable along at least said scanning direction, for supporting the photosensitive workpiece at a second surface; and

a projection optical system, arranged in an optical path between said first surface and said second surface, having aberration correcting means for correcting an aberration of a light flux with an imagewise maximum numerical aperture of at least 0.8.--

--101. A scanning projection exposure apparatus according to claim 100, wherein said aberration correcting means includes an aspherical surface.--

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--102. A scanning projection exposure apparatus according to claim 100, wherein said light flux with the imagewise maximum numerical aperture of at least 0.8 covers an exposure field, on said second surface, having a first dimension of at least 25mm.--

--103. A method of patterning a photosensitive workpiece with a pattern present on a reticle, the method comprising the steps of:

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illuminating said reticle with an illuminating optical system of said exposure apparatus according to claim 100;

projecting light from said reticle with a projection optical system of said exposure apparatus according to claim 100; and

exposing said photosensitive workpiece over an exposure field.--